

unit and having the surfaces to be recognized of different heights, in which heights of the component holding members are controlled so as to bring the surface to be recognized of each of the plurality of components into a recognizable range of the recognition unit and the surfaces to be recognized of the plurality of components are continuously recognized.

2.(Amended) A component recognizing method **as claimed in claim 1**, wherein the plurality of components held by the plurality of component holding members and having the surfaces to be recognized of different heights have such a variation in height that not all the surface to be recognized of the plurality of components are within the recognizable range of the recognition unit when bottom end surfaces of the plurality of component holding members are situated at an identical height.

3.(Amended) A component recognizing method **as claimed in claim 2**, wherein, among the plurality of components held by the plurality of component holding members and having the surfaces to be recognized of different heights which components have such a variation in height that not all the surface to be recognized of the plurality of components are within the recognizable range of the recognition unit when the bottom end surfaces of the plurality of component holding members are situated at an identical height, components of which the surfaces to be recognized are within the recognizable range of the recognition unit are recognized without a selective vertical movement of component holding members holding the components by drive of the single drive unit and without a

change in heights of the surfaces, and components of which the surfaces to be recognized are out of the recognizable range of the recognition unit are recognized so that the surfaces to be recognized are recognized after a positioning operation with a vertical movement of component holding members holding the components is controlled so as to bring the surfaces to be recognized into the recognizable range of the recognition unit.

4.(Amended) A component recognizing method **as claimed in claim 1**, wherein shapes of the components are recognized when the surfaces to be recognized of the components are recognized.

5.(Amended) A component recognizing apparatus for recognizing with one recognition unit surfaces to be recognized of a plurality of components held by a plurality of component holding members which are vertically moved selectively by a single drive unit and having the surfaces to be recognized of different heights, heights of the component holding members are adapted to be controlled so as to bring the surface to be recognized of each of the plurality of components into a recognizable range of the recognition unit and continuously recognizes the surfaces to be recognized of the plurality of components.

6.(Amended) A component recognizing apparatus **as claimed in claim 5**, wherein the plurality of components held by the plurality of component holding members

and having the surfaces to be recognized of different heights have such a variation in height that not all the surface to be recognized of the plurality of components are within the recognizable range of the recognition unit when bottom end surfaces of the plurality of component holding members are situated at an identical height.

7.(Amended) A component recognizing apparatus **as claimed in claim 6**, wherein, among the plurality of components held by the plurality of component holding members and having the surfaces to be recognized of different heights which components have such a variation in height that not all the surface to be recognized of the plurality of components are within the recognizable range of the recognition unit when the bottom end surfaces of the plurality of component holding members are situated at an identical height, components of which the surfaces to be recognized are within the recognizable range of the recognition unit are recognized without a selective vertical movement of component holding members holding the components by drive of the single drive unit and without a change in heights of the surfaces, and components of which the surfaces to be recognized are out of the recognizable range of the recognition unit are recognized so that the surfaces to be recognized are recognized after a positioning operation with a vertical movement of component holding members holding the components is controlled so as to bring the surfaces to be recognized into the recognizable range of the recognition unit.

A1

8.(Amended) A component recognizing apparatus **as claimed in claim 5**, wherein shapes of the components are adapted to be recognized when the surfaces to be recognized of the components are recognized.

A 9.(Amended) A component mounting apparatus comprising:

- a single drive unit;
- a plurality of component holding members which are adapted to be vertically moved selectively by the single drive unit and hold a plurality of components;
- a head unit including the single drive unit and the plurality of component holding members; and
- one recognition unit which is adapted to recognize surfaces to be recognized of the plurality of components held by the plurality of component holding members when the surfaces to be recognized are within a recognizable range,

wherein heights of the component holding members is adapted to be controlled so as to bring the surface to be recognized of each of the plurality of components into the recognizable range of the recognition unit and continuously recognizes the surfaces to be recognized of the plurality of components, when the surfaces to be recognized of the plurality of components held by the plurality of component holding members and having the surfaces to be recognized of different heights are recognized with the one recognition unit while the head unit is moving.

12.(Amended) A component mounting apparatus **as claim d in claim 9**, wherein shapes of the components are adapted to be recognized when the surfaces to be recognized of the components are recognized.

A2

13.(Amended) A component mounting apparatus **as claimed in claim 9**, further comprising: a table which is adapted to be vertically moved by the single drive unit; and cylinders which are fixed to the table, corresponding to the component holding members, and is adapted to bring a tip of a piston into contact with only the component holding member selected so as to be vertically moved among the plurality of component holding members and thereby transmit vertical movement of the table to the selected component holding member.

14.(Amended) A component recognizing method **as claimed in claim 1**, further comprising:

producing a velocity curve in vertical movement of the selected component holding member with parameters of a target position in a direction of height at time when the vertical movement of the selected component holding member is controlled by means of the drive unit so as to position the surface to be recognized of a component within the recognizable range of the recognition unit, a maximum velocity in the vertical movement of the selected component holding member up to the target position, and a

maximum acceleration in the vertical movement of the selected component holding member up to the target position, and

automatically starting a positioning operation, into the recognizable range, of the surface to be recognized of the component held by the selected component holding member driven by the drive unit on a basis of the velocity curve in response to a positioning operation starting instruction upon arrival at a positioning operation starting position of the selected component holding member moving transversely toward the recognition unit.

A2

17.(Amended) A component recognizing apparatus **as claimed in claim 5**, comprising:

a first control unit which is adapted to produce a velocity curve in vertical movement of the selected component holding member with parameters of a target position in a direction of height at time when the vertical movement of the selected component holding member is controlled by means of the drive unit so as to position the surface to be recognized of a component within the recognizable range of the recognition unit, a maximum velocity in the vertical movement of the selected component holding member up to the target position, and a maximum acceleration in the vertical movement of the selected component holding member up to the target position; and

a second control unit which is adapted to drive the drive unit in response to a positioning operation starting instruction and automatically start a

A3

positioning operation of the selected component holding member driven by the drive unit on a basis of the velocity curve, upon arrival at a positioning operation starting position of the selected component holding member moving transversely toward the recognition unit.

A4

20.(Amended) A component mounting apparatus as claimed in claim 9,

wherein the single drive unit is a single motor, and the single motor is adapted to drive a ball screw to rotate and thereby vertically moves a table that is in screw engagement with the ball screw,

the apparatus further comprising: cylinders which are fixed to the table, corresponding to the component holding members, and is adapted to bring a tip of a piston into contact with only the component holding member selected so as to be vertically moved among the plurality of component holding members and thereby transmit vertical movement of the table to the selected component holding members;

a first control unit which is adapted to produce a velocity curve in vertical movement of the selected component holding members by means of the single motor, with parameters of a target position in a direction of height at time when the vertical movement of the selected component holding members is controlled by means of the single motor so as to position the surface to be recognized of a component within the recognizable range of the recognition unit, a maximum velocity in the vertical movement of the selected component holding members up to the target position, and a maximum

acceleration in the vertical movement of the selected component holding members up to the target position; and

a second control unit which is adapted to drive the single motor in response to a positioning operation starting instruction and automatically start positioning operations of the selected component holding members driven by the single motor on a basis of the velocity curve, upon arrival at a positioning operation starting position of the selected component holding members moving with the head unit transversely toward the recognition unit.

Ans

22.(Amended) A component mounting method in which the plurality of components from component feeding units are held by the plurality of component holding members, the components are thereafter recognized with the component recognizing method **as claimed in claim 1**, postures of the plurality of components held by the plurality of component holding members are thereafter corrected on a basis of a recognition result, and the components are thereafter installed on an object to be installed.

23.(Amended) A component mounting apparatus which is adapted to hold the plurality of components from component feeding units by the plurality of component holding members, thereafter recognize the components with the recognition unit of the component recognizing apparatus **as claimed in claim 5**, thereafter correct postures of

AS

the plurality of components held by the plurality of component holding members on a basis of a recognition result, and thereafter install the components on an object to be installed.

24.(Amended) A component recognizing method **as claimed in claim 1**,
wherein

after the plurality of component holding members holding the plurality of components having the surfaces to be recognized of different heights are moved in one direction over the one recognition unit, the plurality of component holding members are moved in a reverse direction opposite to the one direction over the one recognition unit with heights of the plurality of component holding members changed, and

all the plurality of components held by the plurality of component holding members are imaged with the recognition unit in respective movement of the plurality of component holding members in the one direction and in the reverse direction, and the surfaces to be recognized of only components having the surfaces to be recognized brought into the recognizable range of the recognition unit among the plurality of components are recognized.

25.(Amended) A component recognizing method **as claimed in claim 1**,
wherein

the plurality of component holding members holding the plurality of components having the surfaces to be recognized of different heights are moved in one

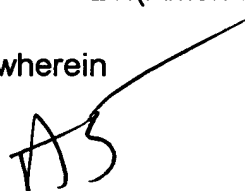
direction over the one recognition unit and the surfaces to be recognized of only components having the surfaces to be recognized brought into the recognizable range of the recognition unit among the plurality of components held by the plurality of component holding members are recognized, and

heights of the plurality of component holding members are changed and the plurality of component holding members are thereafter moved in a reverse direction opposite to the one direction over the one recognition unit and the surfaces to be recognized of only components having the surfaces to be recognized brought into the recognizable range of the recognition unit among the plurality of components held by the plurality of component holding members are recognized.

26.(Amended)

A component recognizing method **as claimed in claim 1**,

wherein

 the plurality of component holding members holding the plurality of components having the surfaces to be recognized of different heights are moved over the one recognition unit and the surfaces to be recognized of only components having the surfaces to be recognized brought into the recognizable range of the recognition unit among the plurality of components held by the plurality of component holding members are recognized, and

heights of the plurality of component holding members are changed and the plurality of component holding members are thereafter moved over a recognition

unit other than the one recognition unit and the surfaces to be recognized of only components having the surfaces to be recognized brought into the recognizable range of the recognition unit among the plurality of components held by the plurality of component holding members are recognized.

27.(Amended) A component recognizing apparatus **as claimed in claim 5**, further comprising a control unit which is adapted to move the plurality of component holding members holding the plurality of components having the surfaces to be recognized of different heights in one direction over the one recognition unit, thereafter move the plurality of component holding members in a reverse direction opposite to the one direction over the one recognition unit with heights of plurality of component holding members changed, perform imaging with the recognition unit of all the plurality of components held by the plurality of component holding members in respective movement of the plurality of component holding members in the one direction and in the reverse direction, and recognize the surfaces to be recognized of only components having the surfaces to be recognized brought into the recognizable range of the recognition unit among the plurality of components.

28.(Amended) A component recognizing apparatus **as claimed in claim 5**, further comprising a control unit which is adapted to move the plurality of component holding members holding the plurality of components having the surfaces to be recognized

of different heights in one direction over the one recognition unit, recognize the surfaces to be recognized of only components having the surfaces to be recognized brought into the recognizable range of the recognition unit among the plurality of components held by the plurality of component holding members, move the plurality of component holding members in a reverse direction opposite to the one direction over the one recognition unit after changing heights of the plurality of component holding members, and recognize the surfaces to be recognized of only components having the surfaces to be recognized brought into the recognizable range of the recognition unit among the plurality of components held by the plurality of component holding members.

29.(Amended) A component recognizing apparatus as claimed in claim 5, further comprising: another recognition unit capable of recognizing surfaces to be recognized of components having heights of the surfaces to be recognized different from those of components which are recognized by means of the one recognition unit; and

a control unit which is adapted to move the plurality of component holding members holding the plurality of components having the surfaces to be recognized of different heights over the one recognition unit, recognize the surfaces to be recognized of only components having the surfaces to be recognized brought into the recognizable range of the recognition unit among the plurality of components held by the plurality of component holding members, move the plurality of component holding members over the another recognition unit other than the one recognition unit after changing heights of the

20160909-030102

AS

plurality of component holding members, and recognize the surfaces to be recognized of only components having the surfaces to be recognized brought into the recognizable range of the another recognition unit among the plurality of components held by the plurality of component holding members.

30.(Amended) A component recognizing method comprising:

moving a plurality of component holding members holding a plurality of components having surfaces to be recognized of different heights in one direction over a recognition unit, thereafter moving the plurality of component holding members in a reverse direction opposite to the one direction over the recognition unit with heights of the plurality of component holding members changed; and

recognizing the surfaces to be recognized of components having the surfaces to be recognized brought into the recognizable range of the recognition unit among the plurality of components held by the plurality of component holding members in respective movement of the plurality of component holding members in the one direction and in the reverse direction.

AS

31.(Amended) A component recognizing apparatus comprising:

a plurality of component holding members which is adapted to hold a plurality of components having surfaces to be recognized of different heights;

a recognition unit over which the plurality of component holding members are capable of moving in one direction and in a reverse direction opposite to the one direction and, after moved in the one direction, are moved in the reverse direction opposite to the one direction with heights of the plurality of component holding members changed and which is adapted to perform imaging of all the plurality of components held by the plurality of component holding members in respective movement of the plurality of component holding members in the one direction and in the reverse direction; and

a control unit which is adapted to recognize the surfaces to be recognized of only components having the surfaces to be recognized brought into a recognizable range of the recognition unit among the plurality of components.

A5 concluded
